IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): An image coding/decoding method in which an image coding apparatus sends coded information which is obtained by coding an original image to an image decoding apparatus and said image decoding apparatus decodes said coded information to obtain a reproduced image, said method comprising the steps of:

extracting edge information which is binary information representing an edge part of said original image;

obtaining density information of an edge unsharpened image from said original image by unsharpening said edge part using said edge information, unsharpening the edge part includes obtaining density information x' of a pixel of said edge part of said edge unsharpened image according to a first equation $x'=(1-\lambda)x+\lambda C$, wherein λ is a positive constant, x is density information of said pixel of said original image, and C is surrounding density information representing density state of a surrounding region of said pixel;

obtaining coded edge information by coding said edge information according to a first coding algorithm;

obtaining coded density information by coding said density information of said edge unsharpened image according to a second coding algorithm;

sending said coded edge information and said coded density information as said coded information to said image decoding apparatus; and

said image decoding apparatus performing the steps of:

obtaining said edge information by decoding said coded edge information according to a first decoding algorithm corresponding to said first coding algorithm;

obtaining said density information of said edge unsharpened image by decoding said

coded density information according to a second decoding algorithm corresponding to said

second coding algorithm;

obtaining said reproduced image from said density information of said edge

unsharpened image by restoring said edge part of said edge unsharpened image by using said

edge information and using a predetermined equation according to a steepest-descent method,

said predetermined equation being defined on the basis of a relationship between said density

information x' formulated by said first equation and restored density information;

wherein said second coding algorithm and said second decoding algorithm are based

on a standard coding method using a discrete cosine transform.

Claim 2 (Previously Presented): The image coding/decoding method as claimed in

claim 1, said image coding apparatus unsharpening said edge part by performing, while

scanning said original image pixel by pixel, the steps of:

performing first matrix operation by using a first block density information vector and

a unsharpening matrix, wherein said first block density information vector is obtained by

arranging density information of each pixel included in a first block, said first block includes

a pixel in said edge part or in a near region of said edge part and includes pixels in a

surrounding region around said pixel, and order of said first block density information vector

corresponds to the number of pixels in said first block, and wherein said unsharpening matrix

includes coefficients used for edge unsharpening which operate on density information of

each pixel in said first block;

obtaining unsharpened density information of each pixel by overlaying density

information of each pixel in said first block obtained by performing said first matrix

operation on each pixel while scanning said original image pixel by pixel.

Claim 3 (Previously Presented): The image coding/decoding method as claimed in claim 2, said image decoding apparatus restoring said edge part of said edge unsharpened image by performing, while scanning said edge unsharpened image pixel by pixel, the steps of:

performing second matrix operation by using a second block density information vector and a restoring matrix which is an inverse matrix of said unsharpening matrix, wherein said second block density information vector is obtained by arranging density information of each pixel included in a second block, said second block includes a pixel in said edge part or in a near region of said edge part and pixels in said surrounding region, and order of said second block density information vector corresponds to the number of pixels in said second block; and

obtaining restored density information of each pixel by overlaying density information of each pixel in said second block obtained by performing said second matrix operation on each pixel while scanning said edge unsharpened image pixel by pixel.

Claims 4-5 (Cancelled)

Claim 6 (Currently Amended): The image coding/decoding method as claimed in claim [[5]] 1, wherein said predetermined equation is $e(X) = \left(X + \dfrac{1}{1-\lambda}(\lambda C(n) - x') \right)^2$ in which C(n) is said surrounding density information for a pixel having density information x' and n is a repetition count number, and a value of X which minimizes e(X) is obtained by said steepest-descent method and said value of X becomes density information of a pixel after being restored.

Claim 7 (Original): The image coding/decoding method as claimed in claim 6,

wherein, in a process according to said steepest-descent method, X is obtained as a

convergence value of a recurrence formula $X(n+1) = X(n) - G * \frac{\delta e}{\delta X}$, wherein G is a

constant.

Claim 8 (Currently Amended): An image coding apparatus comprising:

an edge extracting part for extracting edge information which is binary information

representing an edge part of an original image;

an edge unsharpening part for obtaining density information of an edge unsharpened

image from said original image by unsharpening said edge part using said edge information,

said edge unsharpening part including a density information correction part for correcting

density information of each pixel such that variation of density levels represented by density

information of pixels which are arranged across said edge part in a near region of said edge

part of said original image is lowered, said density information correction part including:

a mean value calculation part for calculating a mean value of density levels in

a predetermined region; and

a density level judgment part for judging whether the density level of a pixel is

higher or lower than said mean value for each pixel in said near region, wherein density

information is corrected for a pixel in which said density level is higher than said mean value

such that said density level is lowered, and density information is corrected for a pixel in

which said density level is lower than said mean value such that said density level is

increased;

a first coding part for obtaining coded edge information by coding said edge

information according to a first coding algorithm;

a second coding part for obtaining coded density information by coding said density

information of said edge unsharpened image according to a second coding algorithm;

wherein said coded edge information and said coded density information are coded

information of said original image, and wherein said second coding algorithm is based on a

standard coding method using a discrete cosine transform.

Claims 9-10 (Cancelled)

Claim 11 (Currently Amended): The image coding apparatus as claimed in claim

[[10]] 8, wherein said density information correction part corrects density information of each

pixel in said near region such that said mean value of said density levels does not change.

Claim 12 (Previously Presented): The image coding apparatus as claimed in claim 8,

said edge unsharpening part comprising:

a unsharpening matrix generation part for generating, for each block which includes

said edge part or a near region of said edge part, a unsharpening matrix which is used for

matrix operation with a block density information vector, wherein said block density

information vector is obtained by arranging density information of each pixel included in a

block, and order of said block density information vector corresponds to the number of pixels

in said block, and wherein said unsharpening matrix includes coefficients used for edge

unsharpening which operate on density information of each pixel in said edge part or in said

near region in said block; and

a matrix operation part for obtaining unsharpened density information of each pixel in said block by performing matrix operation by using said unsharpening matrix and said block density information vector.

Claim 13 (Previously Presented): The image coding apparatus as claimed in claim 8, said edge unsharpening part comprising:

a pixel judgement part for judging whether a pixel exists in said edge part or in a near region of said edge part while scanning said original image pixel by pixel;

a matrix operation part for performing, when said pixel exists in said edge part or in said near region, matrix operation by using a block density information vector and a unsharpening matrix, wherein said block density information vector is obtained by arranging density information of each pixel included in a block, said block includes said pixel and pixels in a surrounding region around said pixel, and order of said block density information vector corresponds to the number of pixels in said block, and wherein said unsharpening matrix includes coefficients used for edge unsharpening which operate on density information of each pixel in said block;

an operation part for obtaining unsharpened density information of each pixel by overlaying density information of each pixel in said block obtained by performing said matrix operation on each pixel while scanning said original image pixel by pixel.

Claim 14 (Original): The image coding apparatus as claimed in claim 13, said pixel judgement part comprising:

a distance conversion part for generating distance information representing distances between said edge part and each pixel; and

a distance judgment part for judging whether said distance information for each pixel

is equal to or smaller than a predetermined value;

wherein, when said distance information is judged to be equal to or smaller than said

predetermined value, it is judged that a pixel corresponding to said distance information

exists in said edge part or in said near region.

Claim 15 (Previously Presented): The image coding apparatus as claimed in claim 8,

wherein said edge unsharpening part obtains density information x' of a pixel of said edge

part of said edge unsharpened image according to an equation $x'=(1-\lambda)x+\lambda C$, wherein λ is a

positive constant, x is density information of said pixel of said edge part of said original

image, and C is surrounding density information representing density state of a surrounding

region of said pixel.

Claim 16 (Currently Amended): An image decoding apparatus which decodes coded

information which includes coded edge information obtained by coding edge information

representing an edge part of an original image and coded density information representing an

edge unsharpened image obtained by unsharpening said edge part of said original image

using said edge information, said image decoding apparatus comprising:

a first decoding part for obtaining said edge information which is binary information

representing said edge part by decoding said coded edge information according to a first

decoding algorithm;

a second decoding part for obtaining density information of said edge unsharpened

image by decoding said coded density information according to a second decoding algorithm;

an edge restoring part for restoring said edge part of said edge unsharpened image by

using said edge information such that a reproduced image is obtained, said edge restoring part

including a density information correction part for correcting density information of each

pixel of said edge unsharpened image such that variation of density levels represented by

density information of pixels which are arranged across said edge part in a near region of said

edge part of said edge unsharpened image is increased, said density information correction

part including:

a mean value calculation part for calculating a mean value of density levels in

a predetermined region; and

a density level judgment part for judging whether the density level of a pixel is

higher or lower than said mean value for each pixel in said near region, wherein density

information is corrected for a pixel in which said density level is higher than said mean value

such that said density level is increased, and density information is corrected for a pixel in

which said density level is lower than said mean value such that said density level is lowered,

wherein said second decoding algorithm is based on a standard coding method using a

discrete cosine transform.

Claims 17-18 (Cancelled)

Claim 19 (Currently Amended): The image decoding apparatus as claimed in claim

[[18]] 16, wherein said density information correction part corrects density information of

each pixel in said near region such that said mean value of said density levels does not

change.

Claim 20 (Previously Presented): The image decoding apparatus as claimed in claim

16, said edge restoring part comprising:

a restoring matrix generation part for generating, for each block in said edge part or a near region of said edge part in said edge unsharpened image, a restoring matrix which is used for matrix operation with a block density information vector, wherein said block density information vector is obtained by arranging density information of each pixel included in a block, and order of said block density information vector corresponds to the number of pixels in said block, and wherein said restoring matrix includes coefficients used for edge restoring which operate on density information of each pixel in said edge part or in a near region of said edge part in said block; and

a matrix operation part for obtaining restored density information of each pixel in said block by performing said matrix operation by using said restoring matrix and said block density information vector.

Claim 21 (Previously Presented): The image decoding apparatus as claimed in claim 20, wherein said restoring matrix generation part generates an inverse matrix of a unsharpening matrix as said restoring matrix in which said unsharpening matrix is used for obtaining density information of said edge unsharpened image which is decoded from said coded density information.

Claim 22 (Previously Presented): The image decoding apparatus as claimed in claim 16, said edge restoring part comprising:

a pixel judgement part for judging whether a pixel exists in said edge part represented by said edge information or in a near region of said edge part while scanning said edge unsharpened image pixel by pixel;

a matrix operation part for performing, when said pixel exists in said edge part or in said near region, matrix operation by using a block density information vector and a restoring

matrix, wherein said block density information vector is obtained by arranging density

information of each pixel included in a block, said block includes said pixel and pixels in a

surrounding region around said pixel, and order of said block density information vector

corresponds to the number of pixels in said block, and wherein said restoring matrix includes

coefficients used for edge restoring which operate on density information of each pixel in

said block;

an operation part for obtaining restored density information of each pixel by

overlaying density information of each pixel in said block obtained by performing said matrix

operation on each pixel while scanning said edge unsharpened image pixel by pixel.

Claim 23 (Previously Presented): The image decoding apparatus as claimed in claim

22, said pixel judgement part comprising:

a distance conversion part for generating distance information representing distances

between said edge part and each pixel; and

a distance judgment part for judging whether said distance information for each pixel

is equal to or smaller than a predetermined value;

wherein, when said distance information is judged to be equal to or smaller than said

predetermined value, it is judged that a pixel corresponding to said distance information

exists in said edge part or in said near region of said edge unsharpened image.

Claim 24 (Previously Presented): The image decoding apparatus as claimed in claim

22, wherein said restoring matrix is an inverse matrix of a unsharpening matrix in which said

unsharpening matrix is used for obtaining density information of said edge unsharpened

image which is decoded from said coded density information.

Claim 25 (Previously Presented): The image decoding apparatus as claimed in claim 16, wherein said edge restoring part restores said edge part of said edge unsharpened image by using a predetermined equation according to a steepest-descent method, said predetermined equation being defined on the basis of a relationship between density information x' of a pixel of said edge part of said edge unsharpened image and restored density information, wherein said density information x' is formulated by a first equation x'=(1-λ)x+λC, wherein λ is a positive constant, x is density information of said pixel of said original image, and C is surrounding density information representing density state of a surrounding region of said pixel.

Claim 26 (Previously Presented): The image decoding apparatus as claimed in claim 25, wherein said predetermined equation is $e(X) = \left(X + \dfrac{1}{1-\lambda}(\lambda C(n) - x') \right)^2$ in which C(n) is said surrounding density information for a pixel having density information x' and n is a repetition count number, and a value of X which minimizes e(X) is obtained by said steepest-descent method and said value of X becomes density information of a pixel after being restored.

Claim 27 (Original): The image decoding apparatus as claimed in claim 26, wherein, in a process according to said steepest-descent method, X is obtained as a convergence value of a recurrence formula $X(n+1) = X(n) - G * \dfrac{\delta e}{\delta X}$, wherein G is a constant.

Claim 28 (Previously Presented): An image decoding apparatus which decodes coded information of an image, said image decoding apparatus comprising:

an edge information obtaining part for obtaining edge information which is binary information representing an edge part of said image;

a decoding part for obtaining density information of said image by decoding said coded information according to a predetermined decoding algorithm;

an edge restoring part for restoring said edge part by using said edge information for said density information of said image such that a reproduced image is obtained, said edge restoring part including a density information correction part for correcting density information of each pixel of said edge unsharpened image such that variation of density levels represented by density information of pixels which are arranged across said edge part in a near region of said edge part of said edge unsharpened image is increased;

a reference value calculation part for calculating a reference value of said density levels in a predetermined region; and

a density level judgment part for judging whether said density level of a pixel is higher or lower than said reference value for each pixel in said near region,

wherein density information is corrected for a pixel in which said density level is higher than said reference value such that said density level is increased, and density information is corrected for a pixel in which said density level is lower than said reference value such that said density level is lowered and wherein said predetermined decoding algorithm is based on a standard coding method using a discrete cosine transform.

Claim 29 (Original): The image decoding apparatus as claimed in claim 28, said edge information obtaining part comprising an edge decoding part for obtaining said edge information by decoding coded edge information which is provided to said image decoding apparatus according to a predetermined decoding algorithm.

Claim 30 (New): An image coding/decoding method in which an image coding apparatus sends coded information which is obtained by coding an original image to an image decoding apparatus and said image decoding apparatus decodes said coded information to obtain a reproduced image, said method comprising the steps of:

extracting edge information which is binary information representing an edge part of said original image;

converting said edge information which is binary information into a distance map including distance values between pixels of said edge part and other pixels;

obtaining density information of an edge unsharpened image from said original image by unsharpening said edge part using said distance map;

obtaining coded edge information by coding said edge information according to a first coding algorithm;

obtaining coded density information by coding said density information of said edge unsharpened image according to a second coding algorithm;

sending said coded edge information and said coded density information as said coded information to said image decoding apparatus; and

said image decoding apparatus performing the steps of:

obtaining said edge information by decoding said coded edge information according to a first decoding algorithm corresponding to said first coding algorithm;

obtaining said density information of said edge unsharpened image by decoding said coded density information according to a second decoding algorithm corresponding to said second coding algorithm;

obtaining said reproduced image from said density information of said edge unsharpened image by restoring said edge part of said edge unsharpened image by using said edge information;

wherein said second coding algorithm and said second decoding algorithm are based

on a standard coding method using a discrete cosine transform.